

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior version, and listings, of claims in the application:

Claims 1-49 (Canceled) Please cancel Claims 1-49.

50. (Original) A polishing apparatus for polishing an object having a film on a surface to be polished, comprising

- a table for holding the object,
- a measuring means for measuring data corresponding to a thickness of the film on the object,
- a cathode member relatively small compared with the surface and arranged to face a region of the surface,
- an electrolytic solution feeding means for feeding an electrolytic solution at least between that region of the surface and the cathode member,
- a power supply for applying a voltage with the cathode member serving as a cathode and the film serving as an anode,
- a control means for controlling application of voltage until removing the target amount of film obtained from the thickness equivalent data when the film is electrolytically polished by electrolytic elution in that region of the surface, and
- a moving means for moving the cathode member to other regions of the surface in order to remove the target amount of film over the entire surface.

51. (Original) A polishing apparatus as set forth in claim 50, wherein the film comprises a copper film.

52. (Original) A polishing apparatus as set forth in claim 50, further comprising a calculating unit for calculating the target amount of the film to be removed from the thickness equivalent data.

53. (Original) A polishing apparatus as set forth in claim 50, wherein the measuring means measures a thickness of the film.

54. (Original) A polishing apparatus as set forth in claim 50, wherein

the measuring means measures an electrolytic current of electrolytic polishing in a region where the cathode member faces the surface, and

the control means controls a voltage to be applied until removing the target amount of film determined by the electrolytic current of the electrolytic polishing in that region of the surface.

55. (Original) A polishing apparatus as set forth in claim 54, wherein the control means determines the target amount of the film remaining at the point of time when the electrolytic current of the electrolytic polishing becomes a specified value to be zero and controls the electrolytic polishing in that region of the surface to finish.

56. (Original) A polishing apparatus as set forth in claim 50, wherein

the cathode member is shaped so as to be able to apply a stronger electric field to a projecting portion than to a recessed portion of the film corresponding to the unevenness of the film in that region of the surface, and

by applying this electric field, the film is polished electrolytically and flattened by electrolytic elution in that region of the surface preferentially from a projecting portion of the film.

57. (Original) A polishing apparatus as set forth in claim 50, wherein

the cathode member is divided into a plurality of regions which are arranged insulated from each other and the cathode member as a whole faces the entire surface, and

by changing the position of application of voltage to the divided cathode member, the substantially equivalent is obtained as when changing the position of the cathode member facing the surface from one region to another region.

58. (Original) A polishing apparatus as set forth in claim 57, wherein the cathode member is divided into a plurality of concentric circular regions.

59. (Original) A polishing apparatus as set forth in claim 50, wherein

the apparatus further comprises an anode member facing the surface and set apart from the cathode member at a certain distance,

the electrolytic feeding means feeds an electrolytic solution between the region of the surface and the cathode member and between the surface and the anode member, and

the power supply applies a voltage to the cathode member and the anode member.

60. (Original) A polishing apparatus as set forth in claim 59, wherein the anode member is comprised of a nobler metal than the material on the surface.

61. (Original) A polishing apparatus as set forth in claim 50, wherein

the apparatus further comprises a polishing means for chemical mechanical polishing and

performs the chemical mechanical polishing in that region of the film at the same time as the electrolytic polishing to flatten the film.

62. (Original) A polishing apparatus as set forth in claim 50, wherein the power supply applies a direct-current voltage with the cathode member as a cathode and the surface as an anode.

63. (Original) A polishing apparatus as set forth in claim 62, wherein the power supply applies a rectangular pulse voltage.

64. (Original) A polishing apparatus as set forth in claim 59, wherein the power source applies an alternating-current voltage to the cathode member and the anode member.

65. (Original) A polishing apparatus as set forth in claim 50, further comprising an ammeter for measuring an electrolytic current of the electrolytic polishing in that region.

66. (Original) A polishing apparatus as set forth in claim 65, wherein the control means controls the voltage applied to the cathode

member and the surface so as to maintain the electrolytic current constant.

67. (Original) A polishing apparatus for polishing an object having a film on a surface to be polished, comprising

- a table for holding the object,
- a measuring means for measuring data corresponding to a thickness of the film on the object,
- a cathode member relatively small compared with the surface and arranged to face a region of the surface,
- an electrolytic solution feeding means for feeding an electrolytic solution including a chelating agent at least between the region of the surface and the cathode member,
- a power supply for applying a voltage with the cathode member serving as a cathode and the film as an anode,
- a control means for controlling the application of voltage until the surface of the film is oxidized by anodic oxidation in that region of the surface and a chelate film of the oxidized material is formed,
- a chelate film removing means for removing the chelate film, and
- a moving means for moving the cathode member to other regions of the surface in order to remove a target amount of the film obtained from the thickness equivalent data over the entire surface.

68. (Original) A polishing apparatus as set forth in claim 67, wherein the film comprises a copper film.

69. (Original) A polishing apparatus as set forth in claim 67, wherein the chelate film removing means selectively removes a

projecting portion of the chelate film corresponding to unevenness of the film.

70. (Original) A polishing apparatus as set forth in claim 67, wherein, as an electrolytic solution, the electrolytic feeding means feeds an electrolytic solution further including a surface-active agent.

71. (Original) A polishing apparatus as set forth in claim 67, further comprising a calculating unit for calculating the target amount of the film to be removed from the thickness equivalent data.

72. (Original) A polishing apparatus as set forth in claim 67, wherein the measuring means measures a thickness of the film.

73. (Original) A polishing apparatus as set forth in claim 67, wherein

the measuring means measures an electrolytic current of the anodic oxidation in a region where the cathode member faces the surface, and

the control means controls the voltage to be applied until removing the target amount of film determined by the electrolytic current of the anodic oxidation in that region of the surface.

74. (Original) A polishing apparatus as set forth in claim 73, wherein the control means determines the target amount of the film remaining at the point of time when the electrolytic current of the anodic oxidation becomes a specified value to be zero and controls the anodic oxidation in that region of the surface to finish.

75. (Original) A polishing apparatus as set forth in claim 67, wherein

the cathode member is shaped so as to be able to apply a stronger electric field to a projecting portion than to a recessed portion of the film corresponding to the unevenness of the film in that region of the surface, and

by applying this electric field, the film is oxidized by anodic oxidation and chelated in that region of the surface preferentially from a projecting portion of the film to flatten the film.

76. (Original) A polishing apparatus as set forth in claim 67, wherein

the cathode member is divided into a plurality of regions which are arranged insulated from each other and the cathode member as a whole faces the entire surface, and

by changing the position of application of voltage to the divided cathode member, the substantially equivalent is obtained as when changing the position of the cathode member facing the surface from one region to another region.

77. (Original) A polishing apparatus as set forth in claim 76, wherein the cathode member is divided into a plurality of concentric circular regions.

78. (Original) A polishing apparatus as set forth in claim 67, wherein

the apparatus further comprises an anode member facing the surface and set apart from the cathode member at a certain distance,

the electrolytic feeding means feeds an electrolytic solution between the region of the surface and the cathode member and between the surface and the anode member, and

the power supply applies a voltage to the cathode member and the anode member.

79. (Original) A polishing apparatus as set forth in claim 78, wherein the anode member is comprised of a nobler metal than the material on the surface.

80. (Original) A polishing apparatus as set forth in claim 67, comprising a wiping means for selectively removing projecting portions of the chelate film corresponding to the unevenness of the film as the chelate film removing means.

81. (Original) A polishing apparatus as set forth in claim 67, wherein the chelate film removing means includes a vibration applying means.

82. (Original) A polishing apparatus as set forth in claim 67, wherein the chelate film removing means includes a jet generating and applying means for applying a jet to the chelate film.

83. (Original) A polishing apparatus as set forth in claim 67, wherein the power supply applies a direct-current voltage with the cathode member as a cathode and the surface as an anode.

84. (Original) A polishing apparatus as set forth in claim 83, wherein the power supply applies a rectangular pulse voltage.

85. (Original) A polishing apparatus as set forth in claim 78, wherein the power source applies an alternating-current voltage to the cathode member and the anode member.

86. (Original) A polishing apparatus as set forth in claim 67, further comprising an ammeter for measuring an electrolytic current of the anodic oxidation in that region.

87. (Original) A polishing apparatus as set forth in claim 86, wherein the control means controls the voltage applied to the cathode member and the surface so as to maintain the electrolytic current constant.

88. (Original) A plating method depositing a plating film on a surface of an object, comprising the steps of
measuring surface height data of the surface or thickness data of the plating film on the object and
making a relatively small anode member compared with the surface face a region of the surface, applying a voltage with the anode member serving as an anode and the surface as a cathode while interposing an electrolytic plating solution at least between the region of the surface and the anode member, and depositing the plating film by plating in that region of the surface until depositing a target amount of the plating film deduced from the surface height data or the thickness data of the plating film at the time of the measurement; wherein
the process of moving the anode member to another region of the surface and depositing a plating film by plating in that other region is repeated over the entire surface.

89. (Original) A plating method as set forth in claim 88, wherein the plating film comprises a copper film.

90. (Original) A plating apparatus for depositing a plating film on a surface of an object, comprising
a table for holding the object,
a measuring means for measuring surface height data of the surface or thickness data of the plating film on the object,
an anode member relatively small compared with the surface and arranged to face a region of the surface,
an electrolytic plating solution feeding means for feeding an electrolytic plating solution at least between that region of the surface and the anode member,
a power supply for applying a voltage with the anode member serving as an anode and the surface as a cathode,
a control means for controlling application of voltage until forming by plating a target amount of the plating film deduced from the surface height data or the plating thickness data at the time of the measurement in that region of the surface, and
a moving means for moving the anode member to other regions of the surface.

91. (Original) A plating apparatus as set forth in claim 90, wherein the plating film comprises a copper film.